

APPLICATION FOR
UNITED STATES LETTERS PATENT

FOR

HIGHLY FLEXIBLE AND ACCESSIBLE FREEZER DRAWER RACK

BY:

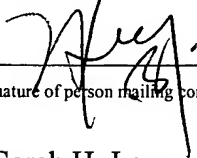
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HIGHLY FLEXIBLE AND ACCESSIBLE FREEZER DRAWER RACK

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention provides a drawer rack system for efficiently storing tubes, bottles, and other containers in an upright freezer. Upon sliding a drawer out of its rack, tubes or bottles may immediately be stored or retrieved. Moreover, tubes of different diameter and size may be stored in this invention without having to use boxes and cell dividers. Additionally, the system allows for quick turnaround when allocating space among bottles, tubes, or boxes.

2. Description of Related Art:

Efficiently storing, retrieving, and keeping track of hundreds or thousands of samples stored in tubes or bottles is no simple task. Today, hundreds or thousands of samples may be stored in a single freezer. Moreover, biotechnology's continued rapid advance will require ever more efficient storage, retrieval, and tracking systems.

For easy access, an upright freezer is often filled with drawers, each of which may contain one or more racks. Ideally, the tubes and/or bottles are stored in a drawer according to some logical relationship. Each drawer can hold one or more boxes. The boxes are either empty so as to accept bottles or outfitted with dividers to stabilize tubes of the same diameter.

Thus, a given tube could be stored in Freezer 1, Rack A, Drawer ii, Box d. While this system is organized and accessible, it still leaves much to be desired. In order to access a single bottle or tube, you must first identify, take out, and then open the box(es) of interest from each drawer. This is not only slow, but it also allows for mistakes (i.e. the tubes or bottles are placed in the wrong box and/or the box is placed in the wrong drawer). Furthermore, if you have tubes of different diameter, you would have to put them in different boxes. As mentioned above, current box dividers create cells of uniform size, meaning that a single box can only store tubes of the same diameter. Clearly, it would be far better if all of the logically related samples were easily stored and accessible from one drawer.

A need exists, therefore, for a system that can efficiently store bottles and/or tubes of different diameter in the same drawer without resorting to cumbersome and confusing boxes.

SUMMARY OF THE INVENTION

The present invention relates generally to providing high accessibility to centrifugal tubes and/or bottles within a freezer drawer rack. More specifically, the present invention is directed
5 toward providing a flexible configuration drawer that is capable of storing bottles and/or tubes of different diameter without the use of cumbersome boxes. Boxes may still be stored in the drawer if so desired. Additionally, the invention allows for easy and quick configuration.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the figures, **Figure 1** depicts a pictorial representation of a **prior art** storage system. The storage system **100** consists of one or more drawers **102**. The drawers are then stored within a frame **104**. For ease of use, the frame **104** may be constructed so that the drawers **102** slide in smoothly. The drawer **102** has a face plate **106**. The face plate **106** is further fitted with a handle **108**. The drawer **102** also has a bottom plate **110**, upon which one or more boxes **10** may be placed. The box **10** may either be plain or fitted with a cell divider. Bottles and other containers may be placed into plain boxes, while sample tubes of the same diameter may be placed into a box containing a divider.

Figure 2 depicts an exemplary storage system in which the present invention may be implemented. The storage system **200** consists of one or more drawers **202**. The drawers are then stored within a frame **204**, as commonly known in the art. For ease of use, the frame **204** may be constructed so that the drawers **202** slide in smoothly, as commonly known in the art. A drawer **202** has a face plate **206**. The face plate **206** is further fitted with a handle **208**, as commonly known in the art. Furthermore, the face plate **206** may be fitted with an identifying card holder **210**. The drawer **202** also has a removable top plate **212** with at least one hole **214**. A bottom plate **218** is fitted to the drawer **202** to support items stored in the drawer **202**.

Those of ordinary skill in the art will appreciate that the storage system **200** depicted in **Figure 2** may vary. The depicted example is not meant to imply physical limitations with respect to the present invention. The frame **204** and the drawers **202**, for example, may take forms other than those shown in **Figure 2**.

Figure 3 depicts an exemplary drawer and plate system **300** within the storage system of **Figure 2** configured to store sample tubes **40**. The drawer **202** has a removable top plate **212**, with at least one hole **214**, that fits securely over the top surface of the drawer **202**. The hole **214** may further accept an insert **216** for stabilizing sample tubes **40**. Thus, sample tubes **40** may be stored and retrieved without the use of cumbersome boxes.

Those of ordinary skill in the art will appreciate that the exemplary drawer and plate system **300** depicted in **Figure 3** may vary. The depicted example is not meant to imply physical limitations with respect to the present invention. The holes **214**, for example, may take shapes and

sizes other than those shown in **Figure 3**. Furthermore, the removable top plate **212** may employ various means commonly known in the art to secure it the drawer **202**.

Figure 4 depicts an exemplary face plate **206** of the drawer of **Figure 2**. The face plate **206** is further fitted with a handle **208**. One object of the invention is to ease the tracking of samples. As such, the face plate **206** has an identifying card holder **210**.

Those of ordinary skill in the art will appreciate that the exemplary face plate depicted in **Figure 4** may vary. The depicted example is not meant to imply physical limitations with respect to the present invention. The identifying card holder **210** and the handle **208**, for example, may take forms other than those shown in **Figure 4**.

Figures 5a-5f depict several exemplary inserts within the storage system of **Figure 2**. **Figure 5a** depicts a standard large inner diameter insert **500**. The insert **500** has a tubular outer casing **502** sized to fit into the hole **214** of the top plate **212**. The outer casing **502** has protruding ribs **504** to keep the insert in place once until it is removed from the top plate **212**. The insert **500** has a circular through-hole **506** with a consistent bore, thereby forming a generally hollow tube.

The insert **510** of **Figure 5b** is identical to the insert **500** of **Figure 5a** except that the circular through-hole **508** bore of **Figure 5b** is smaller size than that of **Figure 5a**. One object of the invention is to provide flexibility. The use of removable inserts with different bore sizes allows for sample tubes **40** of different diameter to be stored and stabilized without the use of boxes.

The insert **520** of **Figure 5c** is identical to the insert **500** of **Figure 5a** except that the circular through-hole **522** of **Figure 5c** forms a funnel. This feature should allow the insert **520** accommodate a wider variety of tube sizes and shapes.

The insert **530** of **Figure 5d** is identical to the insert **500** of **Figure 5a** except that the circular through-hole **532** of **Figure 5d** is lined with protruding flexible fingers **534**. Thus, the insert **530** of **Figure 5d** provides even greater flexibility in accommodating tubes of different shapes and sizes.

The insert **540** of **Figure 5e** is especially well suited for storing cryo-vials. The insert **540** has a tubular outer casing **502** sized to fit into the hole **214** of the top plate **212**. The outer casing **502** has protruding ribs **504** to keep the insert in place once until it is removed from the top plate **212**. Instead of a through-hole, the insert **540** has an open top chamber **542**. The chamber can be sealed by placing a removable lid **544** on top of the insert **540**.

The slide storage insert **550** of **Figure 5f** is designed to hold slides. The base **552** of the slide storage insert **550** is identical to the insert **500** of **Figure 5a**. The slide housing unit **554** is a rectangular container attached to the top of the base **552**. A side lid **556** provides easy access to the interior of the slide housing unit **554**. Horizontal supports **558** on the interior walls of the slide housing unit **554** allow slides **50** to be stacked safely and orderly.

Those of ordinary skill in the art will appreciate that the exemplary inserts depicted in **Figures 5a-5f** may vary. The depicted examples are not meant to imply physical limitations with respect to the present invention. The inserts **500**, **510**, **520**, **530**, **540** and **550** for example, may be constructed with different inner and outer bore sizes, shapes, or otherwise allow for other sample containers to be stored.

Figure 6 depicts an exemplary partitioned drawer **600** within the storage system of **Figure 2** configured for maximum flexibility. The partitioned drawer **600** has a shortened removable top plate **602**, with at least one hole **214**, that fits securely over the top surface of the drawer **202**. The hole **214** may further accept an insert **216** for stabilizing sample tubes **40**. Removable separators **604** securely flank the edges of the shortened removable top plate **602**. Bottles **30** and boxes **10** may now be stored in the same drawer without damaging the sample tubes **40**.

Those of ordinary skill in the art will appreciate that the exemplary partitioned drawer **600** depicted in **Figure 6** may vary. The depicted example is not meant to imply physical limitations with respect to the present invention. The separators **604**, for example, may take different shapes and forms than as depicted. Many different configurations can be implemented to address a wide range of storage needs.

Figure 7 depicts an exemplary tube rack **700** in which the present invention may be implemented. At least one vertical support member **702** is attached to a base **704**. The tube rack **700** has a removable top plate **212**, with at least one hole **214**, that fits securely over the top surface of the vertical support member **702**. The hole **214** may further accept an insert **216** for stabilizing sample tubes **40**. The removable top plate **212** may also be used with the storage system **200** of **Figure 2**.

Those of ordinary skill in the art will appreciate that the exemplary tube rack **700** depicted in **Figure 7** may vary. The depicted example is not meant to imply physical limitations with respect to the present invention. The base **704** and support member **702**, for example, may take different shapes and forms than as depicted.

The present invention is directed toward a storage system for providing high accessibility and flexibility. Specifically, the present invention is directed toward a freezer drawer rack for providing high accessibility and flexibility with respect to storing samples, particularly samples stored in tubes and bottles. One of ordinary skill in the art will recognize that the terms

5 “samples”, “tubes”, and “bottles” encompass a wide variety of things.

Compared to the prior art, accessibility is greatly improved by eliminating the need for separate boxes within a drawer. A removable top plate with holes is fitted to the top of the drawer. Inserts can be fitted into the holes within the removable top plate. The inserts greatly improve flexibility by allowing tubes of different diameter to be stored together in a single
10 drawer without resorting to boxes. The inserts can also be built to store other sample containers, such as cryo-vials and slides. In fact, bottles, tubes and boxes may in fact be stored in a partitioned drawer. Thus, samples from an entire patient or specimen could be easily stored in one drawer.

The description of the present invention has been presented for purposes of illustration
15 and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular
20 use contemplated.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a perspective view of the prior art;

Figure 2 a perspective view of an exemplary storage system in which the present invention may be implemented;

Figure 3 is a perspective view of an exemplary drawer and plate system within the storage system of **Figure 2**;

Figure 4 is a head-on view of an exemplary face plate of the drawer of **Figure 2**;

Figures 5a-5f are perspective views of several exemplary inserts within the storage system of **Figure 2**;

Figure 6 is a perspective view of an exemplary partitioned drawer within the storage system of **Figure 2**; and

Figure 7 is a perspective view of an exemplary tube rack in which the present invention may be implemented.